11/25/08 - 04210

TECHNICAL MEMORANDUM CH2MHILL

# Results of the August 2008 Supplemental Investigation, Operable Unit 16, Site 89 (Former DRMO Facility)

| | |
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| **COPIES:** | Project File |
| **DATE:** | November 25, 2008 |

## Introduction

This technical memorandum presents a summary of the field activities and analytical results for the August 2008 supplemental investigation performed at Site 89, located within Operable Unit (OU) 16, which includes the Former Defense Reutilization and Marketing Office (DRMO), a large wooded area to the east and the south of the DRMO, and a portion of Camp Geiger to the west, at Marine Corps Base (MCB) Camp Lejeune, North Carolina.

The supplemental investigation was conducted to evaluate the presence of chlorinated volatile organic compounds (VOCs) in groundwater and surface water in the area around the eastern portion of Site 89. Groundwater sampling locations were determined based on direction received from the Partnering Team to determine whether groundwater had been impacted in the vicinity of the proposed borings. Surface water sampling locations were based on North Carolina Department of Environment and Natural Resources (NCDENR) comments on the *Comprehensive Remedial Investigation Site 89 – Operable Unit 16 Former Defense Reauthorization and Marketing Office* (CH2M HILL, 2008) for further investigation of surface water impacts in Edwards Creek. Groundwater and surface water sample locations are shown in **Figure 1**.

## Site History

Site 89 is located within the confines of an active military installation under industrial classification. Site 89 is located to the west of the New River, on Camp Geiger near the intersection of G and 8th Street. The site boundary includes the woods to the east and the south of the DRMO and a portion of Camp Geiger to the west. The area east of the former DRMO and north of Edwards Creek is a wooded area. The areas north and west of Site 89 are generally developed, covered with buildings, asphalt, and grass. The former DRMO area is surrounded by a fence with an access gate located near Building TC864. Many of the stormwater ditches north and west of Site 89 flow and discharge into the source of Edwards

Creek near the intersection of 8th and G Streets. The former DRMO drains into Edwards Creek and the drainage ditch along the east side of the site.

The DRMO was operated by the Defense Logistics Agency (DLA) and, until 2000, was used as a storage yard for miscellaneous items such as scrap and surplus metal, electronic equipment, vehicles, rubber tires, fuel bladders (mobile storage tanks), and other material that would be sent offsite. Historical records indicate that the Base Motor Pool operated on the site until approximately 1988. The Base Motor Pool was then relocated to its current location, an asphalt paved area immediately north of the DRMO facility. The Base Motor Pool reportedly used various solvents, such as acetone, trichloroethene (TCE), and 2-butanone (methyl-ethyl-ketone [MEK]), for cleaning parts and equipment. Historical records also indicate that a 550-gallon UST, identified as UST STC-868, was installed at the site in 1983 and used to store waste oil. The UST was removed in 1993. The site has not been used since the DRMO relocated in 2000. The only site activity since that time has been related to environmental investigation and remediation.

# Investigation Activities

## Previous Investigation Activities

Prior investigations performed at Site 89 have found the VOCs TCE and tetrachloroethane (PCA) and their daughter products (dichloroethene [DCE] and vinyl chloride [VC], degradation daughter products of TCE, and trichloroethane [TCA], degradation daughter product of PCA) at elevated concentrations in both soil and groundwater. TCE, PCA, and their respective degradation products have been reported in surface water and sediment samples collected from Edwards Creek adjacent to Site 89. Surface water results from the 2005 Comprehensive Remedial Investigation (RI) are shown on **Figure 2.**

The presence of VOCs within surface water, sediment, and sediment pore-water samples suggests that the impacted groundwater is discharging into Edwards Creek. Additionally, low-level concentrations of VOCs were reported in monitoring wells south of Edwards Creek, suggesting further plume migration. The estimated plume extends southeast and east into the wooded area east of the former DRMO. This plume is primarily within the surficial aquifer and the Upper Castle Hayne aquifer, which ultimately discharge to the New River. However, there is no evidence that shows contamination has reached the New River to date.

## August 2008 Investigation Activities

The supplemental groundwater and surface water investigation was conducted on August 19 and 20, 2008. Groundwater and surface water sample locations are shown in **Figure 1.** Field activities included utility locating, installation of four temporary wells by direct push technology (DPT), groundwater and surface water sampling, temporary well abandonment, surveying, and IDW management.

Four temporary groundwater monitoring wells (IR89-TW300 through IR89-TW303) were installed in the vicinity of Highway 24 to the northeast of Site 89. Two wells were placed at each location with one well screened in the surficial aquifer (between 6 and 19 feet) and the second well screened at a deeper interval (between 18 and 32 feet). Three surface water

samples (IR89-SW50 through IR89-SW52) were collected at approximately 300-foot intervals downstream of the RI surface water sample locations.

Sampling activities included the collection of groundwater from four temporary wells and three surface water locations for VOC analysis by United States Environmental Protection Agency (USEPA) Method 8260B.

# Analytical Results and Discussion

## Groundwater Results

There were no detections of VOCs in any of the four temporary monitoring wells, indicating that the Site 89 VOC plume has not impacted groundwater in the vicinity of the temporary well borings.

## Surface Water Results

Several chlorinated VOCs (1,1,2,2-PCA, 1,1,2-TCA, cis-1,2-DCE, trans-1,2-DCE, TCE, and VC) were detected in the Site 89 surface water samples. Surface water analytical results were screened against North Carolina human health surface water standards (NC 2B standards). 1,1,2,2-PCA was the only compound that exceeded NC 2B standards. This compound exceeded the 2B standard (4 micrograms per liter [µg/L]) at all three surface water sampling locations with concentrations ranging from 7.5 to 10 µg/L and decreasing in the downstream direction. Surface water analytical results are presented in **Table 1** with exceedances shown on **Figure 3.** Preliminary results for surface water samples collected in August 2008 as part of the Site 89 Non-Time Critical Removal Action (NTCRA) sampling are also presented on **Figure 3**.

During the December 2005 RI investigation, the concentration of 1,1,2,2-PCE observed immediately upstream of the IR89-SW50 sample location was 170 µg/L while the August 2008 1,1,2,2-PCA concentration observed in IR89-SW50 was 10 µg/L. Overall analytical results indicate much lower chlorinated VOC concentrations at the August 2008 supplemental sample locations then those observed during the 2005 RI event. The reduction of surface water concentrations may be due to the actions taken at the site including the completion of the soil mixing NTCRA in August 2008 and the installation of the permeable reactive barrier wall in November 2006.

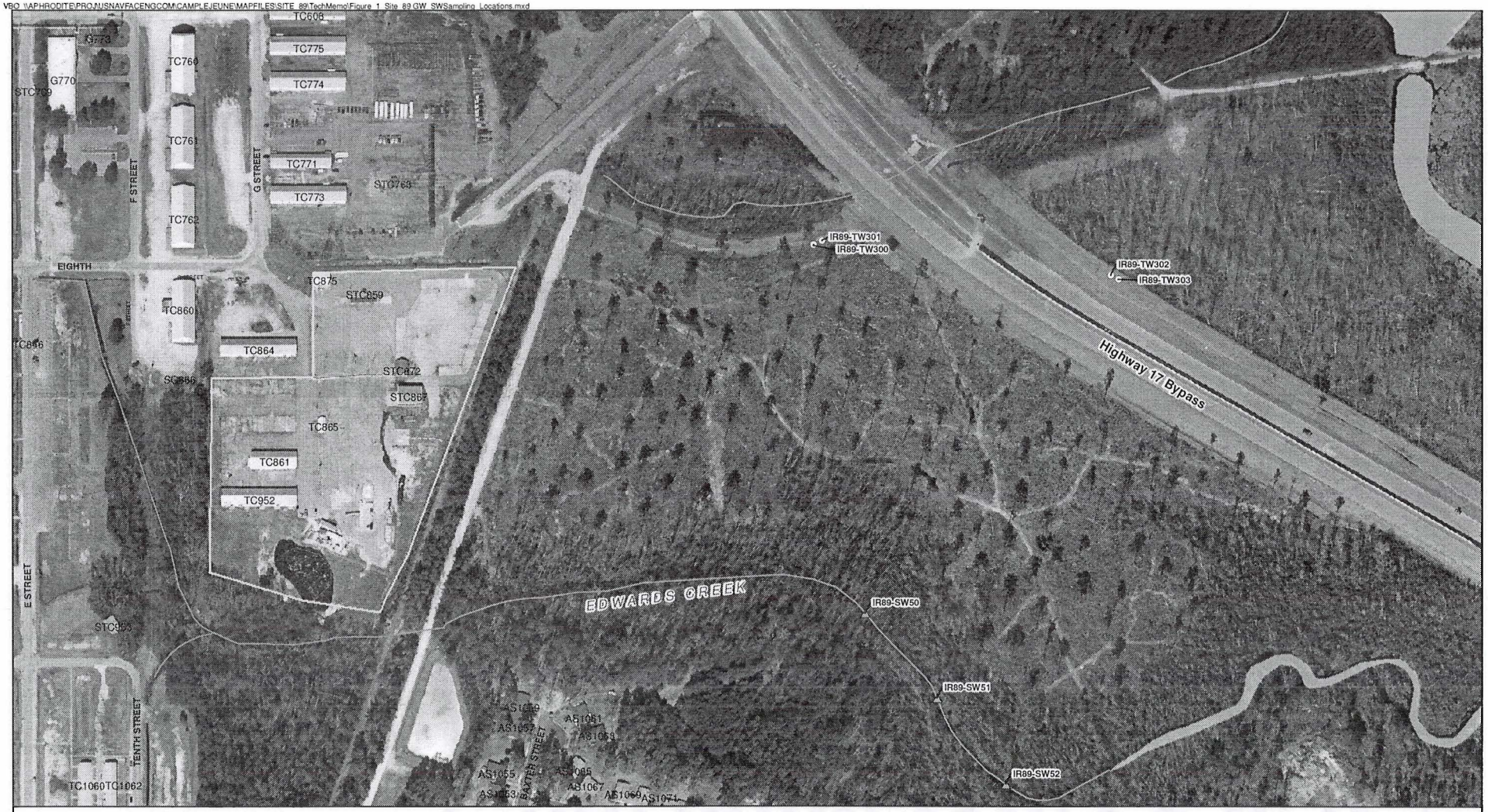


Figure 1
Site 89 Groundwater and Surface Water Sampling Locations
August 2008 Supplemental Investigation
Operable Unit No. 16 Site 89
MCB Camp Lejeune
North Carolina

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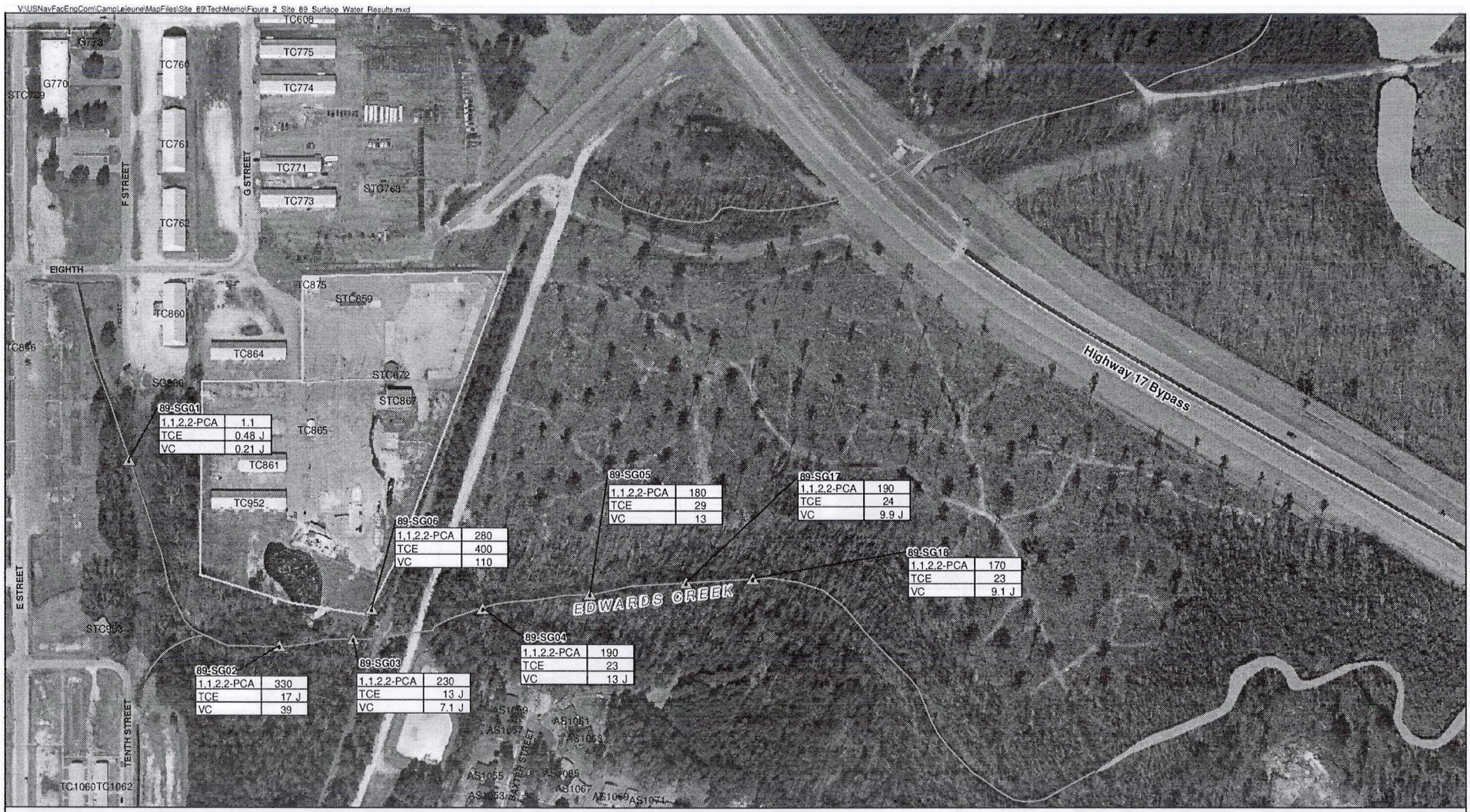
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TC606
TC775
TC774
TC760
TC761
TC771
TC773
TC762
STC763
G773
G770
STC759
F STREET
G STREET
EIGHTH
TC875
STC859
TC860
TC866
TC864
STC872
STC867
SC866
TC865
TC861
TC952
89-SG01
1,1,2,2-PCA 1.1
TCE 0.48 J
VC 0.21 J
89-SG06
1,1,2,2-PCA 280
TCE 400
VC 110
89-SG05
1,1,2,2-PCA 180
TCE 29
VC 13
89-SG17
1,1,2,2-PCA 190
TCE 24
VC 9.9 J
89-SG16
1,1,2,2-PCA 170
TCE 23
VC 9.1 J
Highway 17 Bypass
EDWARDS CREEK
E STREET
STC953
89-SG02
1,1,2,2-PCA 330
TCE 17 J
VC 39
89-SG03
1,1,2,2-PCA 230
TCE 13 J
VC 7.1 J
89-SG04
1,1,2,2-PCA 190
TCE 23
VC 13 J
TENTH STREET
TC1060 TC1062
AS1049
AS1051
AS1053
AS1057
AS1055
AS1063
AS1065
AS1067
AS1069
AS1071
Legend
Surface Water Sampling Location - 2005 RI
Creek
Site 89 Boundary
1,1,2,2,PCA - 1,1,2,2-Tetrachloroethane
TCE - Trichloroethene
VC - Vinyl Chloride
J - estimated value
N
0 125 250 500
Feet
1 inch equals 250 feet
Note:
All concentrations are reported in µg/L
Figure 2
Site 89 Surface Water Results
2005 Remedial Investigation
Operable Unit No. 16 Site 89
MCB Camp Lejeune,
North Carolina
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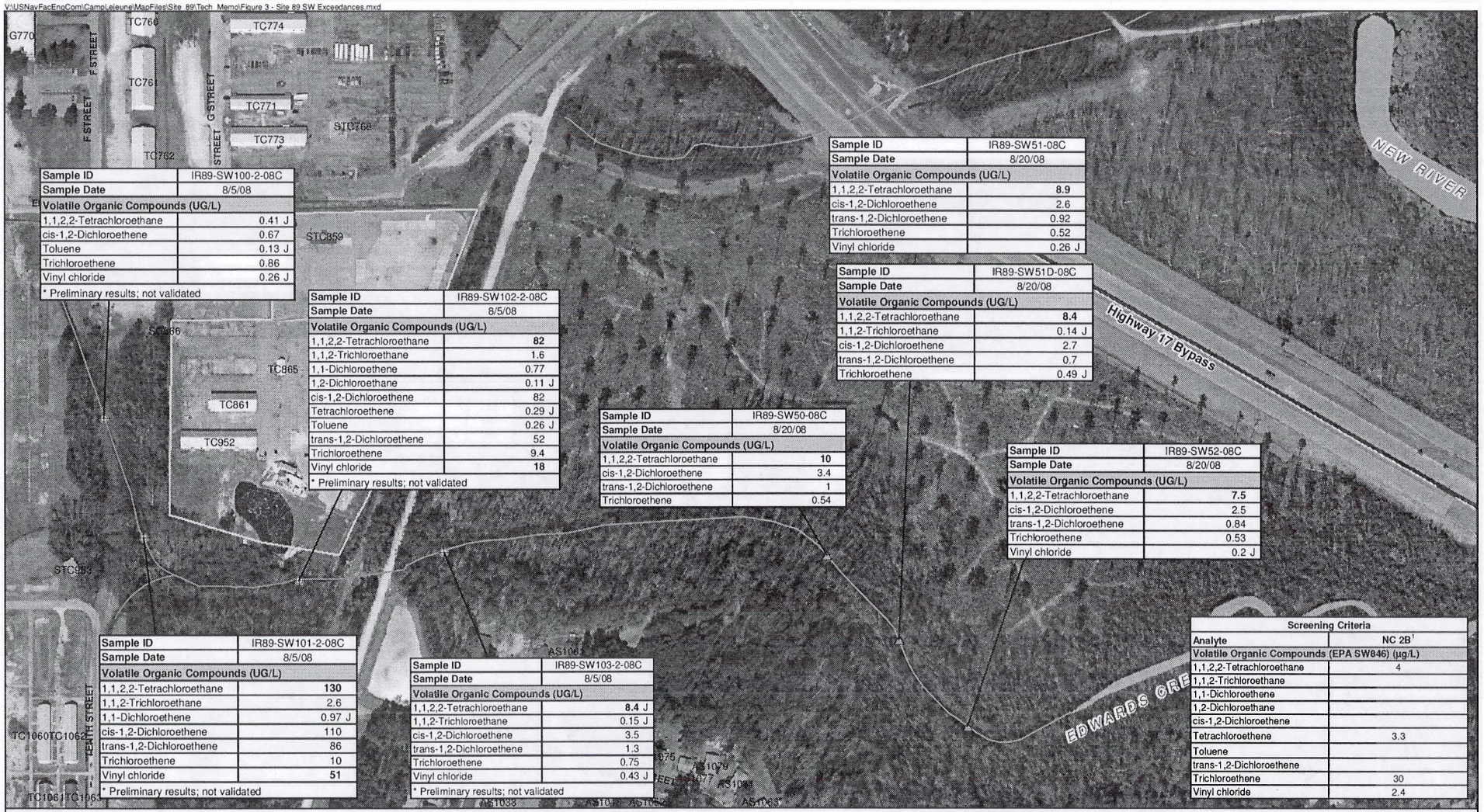


| Sample ID | IR89-SW100-2-08C |
|---|---|
| Sample Date | 8/5/08 |
| Volatile Organic Compounds (UG/L) | |
| 1,1,2,2-Tetrachloroethane | 0.41 J |
| cis-1,2-Dichloroethene | 0.67 |
| Toluene | 0.13 J |
| Trichloroethene | 0.86 |
| Vinyl chloride | 0.26 J |
| * Preliminary results; not validated | |

| Sample ID | IR89-SW102-2-08C |
|---|---|
| Sample Date | 8/5/08 |
| Volatile Organic Compounds (UG/L) | |
| 1,1,2,2-Tetrachloroethane | **82** |
| 1,1,2-Trichloroethane | 1.6 |
| 1,1-Dichloroethene | 0.77 |
| 1,2-Dichloroethane | 0.11 J |
| cis-1,2-Dichloroethene | 82 |
| Tetrachloroethene | 0.29 J |
| Toluene | 0.26 J |
| trans-1,2-Dichloroethene | 52 |
| Trichloroethene | 9.4 |
| Vinyl chloride | **18** |
| * Preliminary results; not validated | |

| Sample ID | IR89-SW101-2-08C |
|---|---|
| Sample Date | 8/5/08 |
| Volatile Organic Compounds (UG/L) | |
| 1,1,2,2-Tetrachloroethane | **130** |
| 1,1,2-Trichloroethane | 2.6 |
| 1,1-Dichloroethene | 0.97 J |
| cis-1,2-Dichloroethene | 110 |
| trans-1,2-Dichloroethene | 86 |
| Trichloroethene | 10 |
| Vinyl chloride | **51** |
| * Preliminary results; not validated | |

| Sample ID | IR89-SW103-2-08C |
|---|---|
| Sample Date | 8/5/08 |
| Volatile Organic Compounds (UG/L) | |
| 1,1,2,2-Tetrachloroethane | **8.4** J |
| 1,1,2-Trichloroethane | 0.15 J |
| cis-1,2-Dichloroethene | 3.5 |
| trans-1,2-Dichloroethene | 1.3 |
| Trichloroethene | 0.75 |
| Vinyl chloride | 0.43 J |
| * Preliminary results; not validated | |

| Sample ID | IR89-SW50-08C |
|---|---|
| Sample Date | 8/20/08 |
| Volatile Organic Compounds (UG/L) | |
| 1,1,2,2-Tetrachloroethane | **10** |
| cis-1,2-Dichloroethene | 3.4 |
| trans-1,2-Dichloroethene | 1 |
| Trichloroethene | 0.54 |

| Sample ID | IR89-SW51-08C |
|---|---|
| Sample Date | 8/20/08 |
| Volatile Organic Compounds (UG/L) | |
| 1,1,2,2-Tetrachloroethane | **8.9** |
| cis-1,2-Dichloroethene | 2.6 |
| trans-1,2-Dichloroethene | 0.92 |
| Trichloroethene | 0.52 |
| Vinyl chloride | 0.26 J |

| Sample ID | IR89-SW51D-08C |
|---|---|
| Sample Date | 8/20/08 |
| Volatile Organic Compounds (UG/L) | |
| 1,1,2,2-Tetrachloroethane | **8.4** |
| 1,1,2-Trichloroethane | 0.14 J |
| cis-1,2-Dichloroethene | 2.7 |
| trans-1,2-Dichloroethene | 0.7 |
| Trichloroethene | 0.49 J |

| Sample ID | IR89-SW52-08C |
|---|---|
| Sample Date | 8/20/08 |
| Volatile Organic Compounds (UG/L) | |
| 1,1,2,2-Tetrachloroethane | **7.5** |
| cis-1,2-Dichloroethene | 2.5 |
| trans-1,2-Dichloroethene | 0.84 |
| Trichloroethene | 0.53 |
| Vinyl chloride | 0.2 J |

| Screening Criteria | |
|---|---|
| Analyte | NC 2B[1] |
| Volatile Organic Compounds (EPA SW846) (µg/L) | |
| 1,1,2,2-Tetrachloroethane | 4 |
| 1,1,2-Trichloroethane | |
| 1,1-Dichloroethene | |
| 1,2-Dichloroethane | |
| cis-1,2-Dichloroethene | |
| Tetrachloroethene | 3.3 |
| Toluene | |
| trans-1,2-Dichloroethene | |
| Trichloroethene | 30 |
| Vinyl chloride | 2.4 |

**Legend**
- Surface Water Sampling Location -- NTCRA
- Surface Water Sampling Location -- Supplemental Investigation
- Creek
- Site 89 Boundary

Notes:
J - Analyte present. Value may or may not be accurate or precise
U - The material was analyed for, but not detected
UG/L - Micrograms per liter
UJ - Analyte not detected, quantitation limit may be inaccurate
**Bold indicates exceedence of NC 2B standard**
[1] Human Health exposure values presented

N

0 125 250 500 Feet

1 inch equals 250 feet

Figure 3
Site 89 Surface Water Exceedences
August 2008 Supplemental Investigation
Operable Unit No. 16 Site 89
MCB Camp Lejeune
North Carolina

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***Table 1***
*Surface Water Analytical Results*
*August 2008 Supplemental Investigation*
*OU 16, Site 89*
*MCB Camp Lejeune, North Carolina*

| Sample ID | | IR89-SW50-08C | IR89-SW51-08C | IR89-SW51D-08C | IR89-SW52-08C |
|---|---|---|---|---|---|
| Sample Date | NCAC 2B[1] | 8/20/08 | 8/20/08 | 8/20/08 | 8/20/08 |
| **Chemical Name** | | | | | |
| | | | | | |
| **Volatile Organic Compounds (UG/L)** | | | | | |
| 1,1,1-Trichloroethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,1,2,2-Tetrachloroethane | 4 | **10** | **8.9** | **8.4** | **7.5** |
| 1,1,2-Trichloroethane | -- | 0.5 U | 0.5 U | 0.14 J | 0.5 U |
| 1,1-Dichloroethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,1-Dichloroethene | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,2,4-Trichlorobenzene | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,2-Dibromo-3-chloropropane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,2-Dichlorobenzene | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,2-Dichloroethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,2-Dichloropropane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,3-Dichlorobenzene | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| 1,4-Dichlorobenzene | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Bromochloromethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Bromodichloromethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Carbon tetrachloride | 1.6 | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Chlorobenzene | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Chloroethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Chloroform | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Chloromethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| cis-1,2-Dichloroethene | -- | 3.4 | 2.6 | 2.7 | 2.5 |
| cis-1,3-Dichloropropene | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Dibromochloromethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Dichlorodifluoromethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Methylene chloride | -- | 0.5 UJ | 0.5 UJ | 0.5 UJ | 0.5 UJ |
| Tetrachloroethene | 3.3 | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| trans-1,2-Dichloroethene | -- | 1 | 0.92 | 0.7 | 0.84 |
| trans-1,3-Dichloropropene | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Trichloroethene | -- | 0.54 | 0.52 | 0.49 J | 0.53 |
| Trichlorofluoromethane | -- | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Trichlorotrifluoroethane | 30 | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Vinyl chloride | 2.4 | 0.5 U | 0.26 J | 0.5 U | 0.2 J |

**Notes:**

J - Analyte present. Value may or may not be accurate or precise

U - The material was analyed for, but not detected

UG/L - Micrograms per liter

UJ - Analyte not detected, quantitation limit may be inaccurate

**Bold indicates exceedence of NC 2B standard**

[1] Human Health exposure values presented